LINCOLNSHIRE

NATURALISTS' UNION.

TRANSACTIONS, 1939-1942.

VOLUME TEN.

EDITED BY F. T. BAKER, F.R.E.S. & A. ROEBUCK, N.D.A., F.R.E.S

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AND
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Lincolnshire Naturalists' Union.

Founded June 12th, 1893.

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STATEMENT OF ACCOUNT from January 1st to December 31st, 1944.

GENERAL FUND.

RECEIPTS.	£	s.	d.
Balance in Bank, 1st January, 1944	18	4	0
Members' Subscriptions	51	7	6
	£69	11	6

PAYMENTS.	£	s.	d.
Postages and small payments	14	7	1
Notices of meetings	5	3	0
Letter-headings	1	12	6
Nature Reserves Sub-Committee Report ...	1	16	8
Envelopes	1	5	0
Part cost of photographic materials	1	1	0
Cheque Book	0	5	0
Grant to Publication Fund	24	8	2
Balance in Bank, 31st December, 1944	19	13	1
	£69	11	6

PUBLICATION FUND.

	£	s.	d.
Donations to Publication Fund	17	14	0
Sale of Transactions and binding	12	18	6
Grant from General Fund	24	8	2
	£55	0	8

	£	s.	d.
Printer's Account for "Transactions" ...	49	7	6
Envelopes and carriage on "Transactions" ...	0	12	0
Binding of "Transactions"	5	1	2
	£55	0	8

SEPARATE ACCOUNT.

Life Members' Subscriptions invested in P. O. Savings Bank.

	£	s.	d.
Amount shown on Balance Sheet, 1943 ...	116	6	2
Interest for 1943 and 1944	6	0	2
Life Member's Subscriptions	20	0	0
	£142	6	4

	£	s.	d.
Income Tax, 1944-5	1	5	0
Balance on 31st December, 1944	141	1	4
	£142	6	4

Lincolnshire Naturalists' Union.

Presidential Address

Delivered at Lincoln, 3rd March, 1945,

BY

RAYMOND HULL, PH.D., D.I.C.

FUNGI, VIRUSES AND SUGAR.

Man's constant endeavour is to produce larger and better crops. In the past, when virgin territory has been exploited, suitable areas have been brought under cultivation, only to be deserted for fresh fields when yields have fallen because of exhausted fertility. This type of soil robbery is short lived for its consequences are disastrous. More conservative farmers have endeavoured to improve crop yields; firstly by better cultural practices, manuring with natural and manufactured fertilisers, and by the development of better varieties of crop plants; and secondly, by preventing crop losses through the ravages of pests and diseases.

Although the attacks of insect pests are easily understood by the countryman, the conception of parasitic fungi, bacteria and viruses attacking plants and producing a diseased condition is not easily formed. There is a strong tendency to assume that plants are in a mysterious way "unhealthy" and the organisms which the scientist finds associated with the diseased plants are the consequence and not the cause of the ill health. This is true to a limited degree in those instances in which weakly parasitic organisms establish themselves on moribund plant tissues, but the majority of diseases with which the plant pathologist is concerned are such that the plant

remains healthy in the absence of the parasitic organism, and becomes diseased only when the parasite is present and environmental conditions are favourable for its attack. When crops are cultivated conditions often favour the parasite. Infectious diseases spread easily when plants are grown in concentrated masses. Whereas in the wild state plants sometimes have genetical factors of disease resistance or tolerance in their make-up, these may be lost when it is attempted to breed higher yielding and better quality varieties. It is then necessary to attempt to re-introduce the genes of resistance into the cultivated varieties by crossing them with wild plants, and this sometimes leads to successful control of disease.

The sugar beet crop has now been grown in Lincolnshire for less than two decades, but even in this short time diseases have become established which cause serious losses. Occasionally there are instances in which crops on limited areas are completely lost, but more frequently the serious effects of disease are the result of smaller losses over large areas. The yield of sugar obtained from a crop of sugar beet is dependent upon the weight of roots harvested and also the sugar content of the roots, and disease affects the yield of sugar by reducing both. The total number of diseases which affect any crop is very considerable, so in this paper I have endeavoured to describe only the more interesting and important which occur in this county, and thereby to illustrate the nature of plant diseases in general.

There are a number of different fungi which attack the hypocotyl of young seedlings, causing it to wither and produce the condition known as Black Leg or Damping-off. Some of these fungi, *Pythium* spp. *Rhizoctonia solani* and *Fusarium* spp., live a free existence in the soil and attack the seedlings only when conditions are either particularly unfavourable for the development of the seedlings, or particularly suitable for the parasitic activities of the fungi. Attacks of this type occur in odd fields of beet every year, but they are seldom serious and the most usual result is a thin or patchy stand of plants.

Another type of fungus causing Black Leg is *Phoma Betae*,

which lies dormant in the seed integuments while the seed is dry but becomes active when the seedlings begin to develop. Seed may be heavily infected and if conditions are favourable for the development of the fungus heavy losses of seedlings may be experienced. The fungus is interesting because it attacks beet in all stages of development; as seedlings causing Black Leg; on the leaves causing Leaf Spots; on the roots causing a crown rot, which may become a deep decay when roots are stored; and it causes a stem rot of beet seed crops. Infected seed results from the fungus becoming established on seed plants. There may be only slight infection on moribund tissues during the growing season, but this spreads as the plants mature. If the weather is favourable for rapid ripening and harvest, *Phoma* attack makes little headway, but if conditions are dull and wet, the fungus develops throughout the plant and so into the seed coat. When the crop is stacked in a moist condition this fungal attack continues and the germination of the seed is reduced.

A very effective control measure against this type of disease has been developed. The seed is dusted with a fungicidal organic mercury compound which kills or restricts the development of the fungus while allowing the seedling to germinate and develop unimpaired. Since 1937, practically all beet seed has been treated and Black Leg due to *Phoma Betae* has been controlled completely from the commercial point of view.

The greatest losses of seedlings are from other causes than fungal diseases. The establishment of seedlings in cultivation is a battle against the same ecological factors which determine the establishment of plants in wild conditions, but the farmer attempts to arrange conditions so that his endeavours are successful. Rabbits, game, wireworms, millipedes, chafers and other pests all take toll. Wind erosion is a serious problem in districts of light soil, because the fields must be left in a smooth, fine condition when the seed is sown and strong winds may then remove the top soil. The greatest seedling losses arise from attempting to grow beet crops on land which

is sour. Beet is very intolerant of soil acidity and such soils will support the crop only after they have been well limed. The injury from acidity becomes more apparent in dry conditions, and on land which is impoverished in nutrients and organic material.

Seedlings which make partial recovery from diseases of the hypocotyl may give rise to plants afflicted with a trouble having the descriptive name of Strangles. The plant is constricted at ground level, so that the over-ground parts are attached to the root by the merest thread of tissue, and a gust of wind or a touch with the hand or hoe will sever them. It is very alarming to find established plants decapitated in this way, and until the constriction is examined it might be believed that the stem had been severed by an animal. The disease cannot easily be reproduced in its typical form under artificial conditions, but the various stages of development of the constriction from the injury to the seedling to typical Strangles can usually be found in the field. A very similar disease of flax has been proved by experiment to be due to bright sunshine heating the surface of the soil around the young seedlings to such an extent that the hypocotyl is scorched, and it is possible that this is another cause of the trouble in beet.

One of the most important diseases of sugar beet in this county is Downy Mildew, caused by *Peronospora Schachtii*. Like other Downy Mildew diseases, its spread is favoured by dull, humid conditions when the plants are covered with a film of moisture for long periods, and its ravages are severely restricted in warm dry weather.

This fungus does not have the Jekyl and Hyde existence of many fungi, at one time harmlessly living on dead organic matter and decomposing vegetable remains only to attack living plants as soon as opportunity allows. *Peronospora Schachtii* can grow actively only in living tissue; it is an inconvertible criminal in the eyes of man. It will not even succumb to his temptings and obligingly develop in artificial media to provide the experimenter with a supply of spores. It

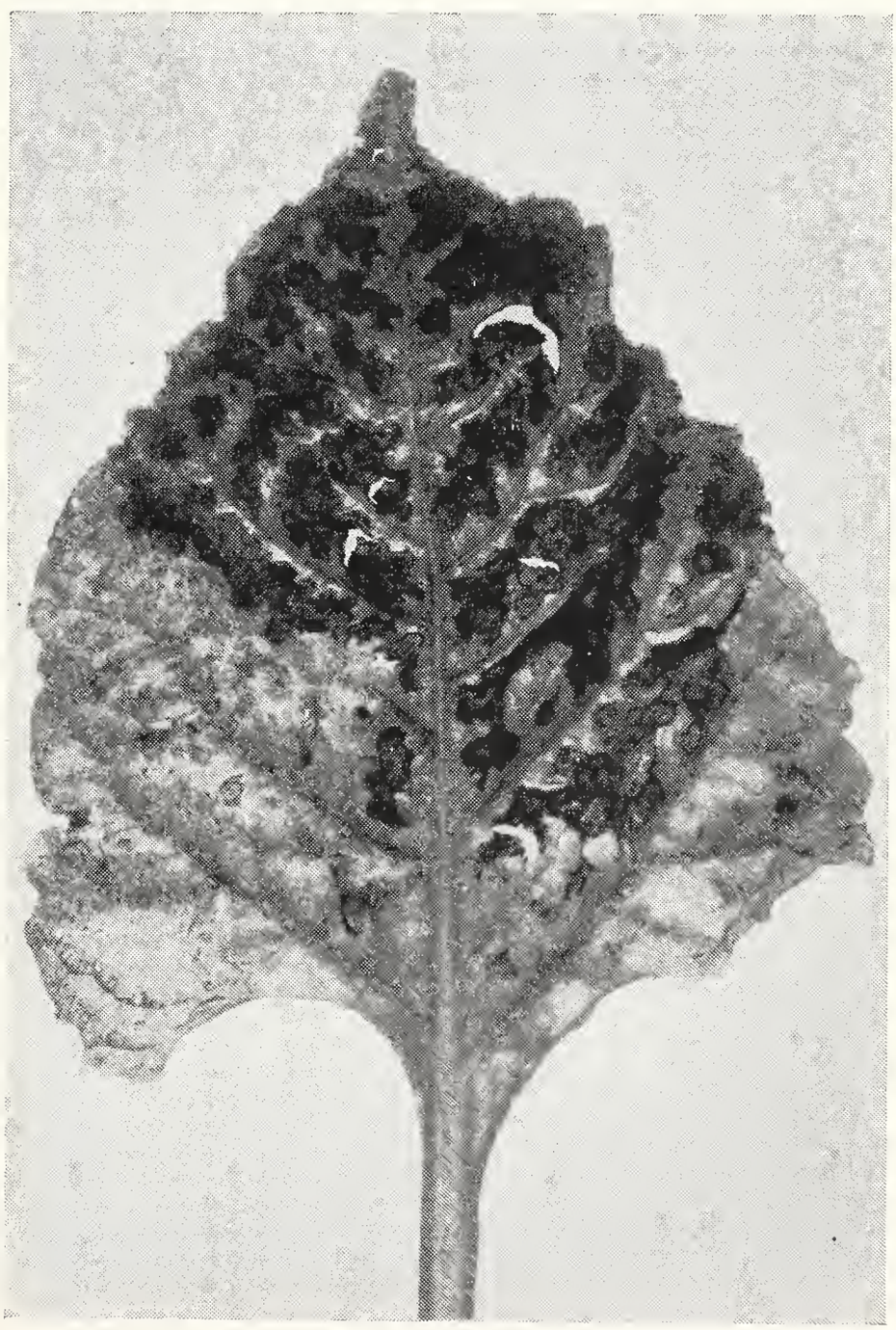
flourishes only on living plants, and after having arranged for its continuance elsewhere by producing spores, its vegetative growth dies with the tissues from which it has extracted its sustenance. Obviously an organism of this type has some difficulty in persisting over-winter. Theoretically it is able to do this by producing resting spores in the plant tissue which it attacks towards the end of the summer, which lie dormant till the following season either in the seed coat or in the soil. Although these resting spores have been found in France and America, none have been seen in this country, and there is no evidence that they are an important means by which infection is carried over from year to year.

The sugar beet is a biennial, producing a tap root stocked with sugar at the end of the first season, and developing an inflorescence and seed in the second year of growth. In order to produce seed commercially, plants are sown in the summer, retained over winter and planted out in the following spring. It is in these seed-crop plants that the fungus persists over winter. As the plants develop in the spring, the fungus becomes active in the freshly formed tissues, and soon produces a mass of spores on the surface of infected leaves, which are carried about in air currents not only to other healthy seed plants, but also to nearby fields in which root crops are developing. With favourable conditions, these spores germinate and intrude the spawn which develops into the tissues of the plant so that it too eventually becomes systematically infected and produces a crop of spores. And so the fungus goes in a cycle from root crop to seed plants amongst which it spreads during the autumn, winter and spring, and then again to root crops in which it multiplies throughout the summer. It is not surprising therefore that the disease is worst in districts where seed crops are grown. In root crops adjacent to seed crops early and severe infection occurs, causing reduction in root and sugar yield. In districts further away less infection is encountered, until in Scotland, where no seed is grown, the disease is practically unknown. In Lincolnshire, the beet seed crop is largely concentrated in

the south of the county, and that is where the most severe infestations occur.

In endeavouring to control plant diseases the pathologist is not in general able to cure plants which have become diseased. As medicine is searching for means of preventing the spread of human diseases; as the most effective measure against malaria is the elimination of the insect which carries it, so also is the plant pathologist's objective to prevent crops becoming infected by attacking the parasitic organism at the most vulnerable point in its life history. The cycle of Downy Mildew may be broken by keeping the young plants healthy by the obvious precaution of sowing them in districts where there are no other diseased crops from which infection could spread. But this may not always fit in with the grower's plans and facilities and it may be necessary to raise the plants in the same neighbourhood as root crops and ripening seed crops. He must then resort to spraying the young seed plants. The most effective spray against fungoid diseases is that mixture of copper sulphate and lime, known as Bordeaux Mixture. The value of this preparation as a fungicide was found by chance from observations in France in 1882. It was the custom of the vine growers "to bespatter the plants along the pathways through the vineyards with a conspicuous and poisonous-looking concoction of verdigris or copper sulphate and lime, to discourage the passers-by from sampling the grapes"(1). Where the plants were well covered with this mixture they remained free from the mildew which was then threatening the destruction of the French vine-growing industry. But even this valuable weapon against the attacks of parasitic fungi must be kept in continuous use if it is to control disease. Its beneficial effects arise only from preventing infection. The fungus which has already penetrated into plant tissues is safe from its toxic effects. It prevents disease only by killing the growth on the surface of the leaves and by preventing the fungal spores from germinating and attacking the plant tissues. To obtain control of a disease by spraying, it is necessary not only to treat the plant before the disease establishes itself, but

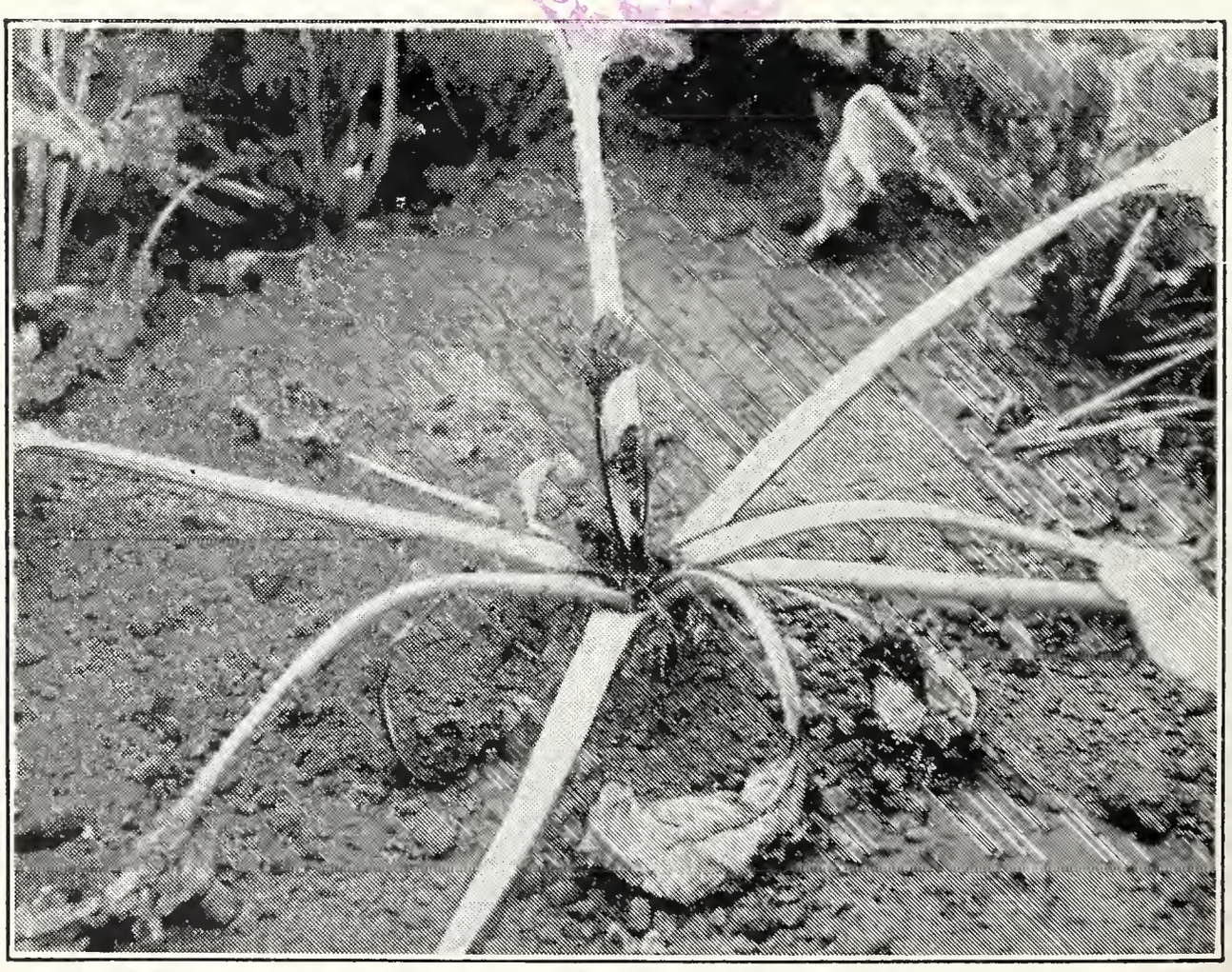
A.—Sugar beet plant infected with Downy Mildew (*Peronospora Schachtii*)



B.—Advanced stage of the symptoms on sugar beet caused by the beet yellows virus

C.—The field appearance of sugar beet plants suffering from Speckled Yellows, resulting from manganese deficiency

D.—Sugar beet plant affected with Violet Root Rot (*Helicobasidium purpureum*)



E.—Heart Rot of sugar beet due to boron deficiency

also to keep the old and new growth continuously covered with a film of the copper containing material. So if the young seed plants grown near the diseased crops are to be kept free from serious infection they must be sprayed at frequent intervals till wintery conditions eliminate the chance of further spores settling on them. Having obtained healthy plants, the seed crop remains healthy and no longer menaces the root crops in the district around it.

There are quite a number of other leaf diseases which occur regularly in Lincolnshire but have so far been of little material importance. Cercospora Leaf Spot (*Cercospora beticola*) appears in small quantity towards the end of hot summers. In hot climates such as Spain and mid-Europe, it may be a devastating disease and most extensive control measures have to be applied against it, but in England, atmospheric conditions have never favoured it for sufficiently long periods for it to have become epidemic. Powdery Mildew (*Oidium* sp.) has been recorded in Lincolnshire during the last two seasons for the first time. The affected leaves appear to have been dusted with a white pulverulent meal, but are in fact covered with an intertwined weft of fungal strands which send down their suckers into the leaf tissue, whilst chains of spores are thrust into the air to be scattered like seeds and take root when they settle on a suitable substrate. Eventually the leaf dies on which the fungus has grown and the beet plant is left so much the poorer. The attacks of this Mildew have not been sufficient to cause concern to farmers, but the fungus is of interest because it raises an academic problem. Only the vegetative form and asexual spores have been found; the sexually produced resting spores have not been seen yet, so the fungus cannot be given a fully descriptive name. The Rust disease (*Uromyces Betae*) also seldom reaches serious proportions, although it may partly defoliate crops which are excessively forced with nitrogenous manures. The aecidia are occasionally found on young seed plants in the spring, and like most Rusts are a delightful picture under the microscope. Different types of spores called uredospores are produced to suit the

function of disseminating the fungus during the summer, and in the autumn teleutospores are produced in pustules and remain dormant on the dead foliage during the winter, germinating in the spring to produce sporidia, which infect the young beet foliage. The beet Rust does not have a dramatic change of host like *Puccinia graminis* which alternates between wheat and barberry.

By far the most frequently occurring root disease of sugar beet is Violet Root Rot, caused by *Helicobasidum purpureum*. This fungus envelops the underground parts with a weft of hyphae and forces its way into the root tissues by puncturing the skin under small, pin-head-like infection cushions formed from a hard, tangled knot of mycelial strands. As the fungal haustoria sap nourishment from the cells of the root they cause a rot which is shallow at first but which becomes deeper as other organisms gain entrance and extend the decay. Although this fungus spends practically all its vegetative existence on the underground parts of plants, at the end of the summer, when it has built up a considerable mycelial mass and reserve of food material, it spreads over the surface of the ground around its host and produces a colourful resupinate mycelial felt, which in the following spring becomes the basidiomycete fruiting body from which the fungus is named. Many fungi have had their vegetative stage named before the fruiting body was associated with it, and in this case the mycelium was for long known as *Rhizoctonia Crocorum*, till the perfect stage was associated with it in 1927.

Although the basidiospores may reproduce the fungus and allow it to invade fresh fields, they are not the chief means by which the fungus persists as a parasite of agricultural crops. It does this mainly by producing hard, resistant resting bodies known as sclerotia, which remain dormant in the soil long after the roots of the plant on which they were formed are decomposed. When next a crop susceptible to attack is grown, the sclerotia germinate and produce mycelial strands which become attached to the new host and continue their parasitic activity on it. Sclerotia may persist in the soil for some years

but the number remaining viable gradually decreases. Infected fields kept free from susceptible crops will eventually become free from the disease. On the other hand growing susceptible crops continuously on the same soil will gradually build up a more severe infestation. Some of the worst attacks in sugar beet occur when it is grown after carrots, which are also susceptible.

When the incidence of this disease was investigated, it was soon found to be of widespread occurrence in Lincolnshire. Frequently fields were found with heavy infection which had not carried susceptible farm crops for many years, or which were freshly ploughed grass sward. This seemed to be mysterious until it was found that the fungus attacked and thrived on a number of weeds, and severe attacks on farm crops could often be associated with infection on weeds with perennial rootstocks, such as yarrow and clovers.

The intensity of this disease and its fluctuations from year to year in a field depend upon a number of factors. Light soil with good aeration favours its growth, and yet there must be sufficient moisture. The fungus is slow growing at ordinary temperatures and bursts into vigorous activity only when the soil is heated by summer sunshine. The intensity of an attack depends largely upon the amount of infective material in the soil, and so upon the number of sclerotia produced and surviving from the previous infected crop. The conditions favouring the survival of sclerotia require investigation but by analogy with similar organs of other fungi, they prefer being left alone and do not survive long in a well cultivated, well manured field. The present position in Lincolnshire is that although the disease attacks crops in some fields severely and occurs in small degree on large acreages, it is probable that traditional principles of good farming—rotation of crops, fields free from weeds, deep and thorough tillage—will keep it at bay.

Many different types of root diseases have been described and a considerable number have been found in Lincolnshire. Three which are of interest may be briefly described. In the wet summer of 1936 many low-lying places were flooded for

two or three weeks. Sugar beet will not tolerate excessive moisture, and normally in these conditions the plants are stunted, turn yellow, and the roots become scurfy and distorted. But in some fields the roots in these patches rotted away with a characteristic greyish rot which developed upwards from the tail. When tissue from the advancing edge of this root was placed on sterile medium concocted from potato and solidified with agar, a fungus invariably grew out. It was *Phytophthora megasperma*, and although it had previously been isolated from potatoes in Great Britain it was a new record on sugar beet.

Another type of root disease which is very common is Scab. This is caused by yeasts (*Actinomyces scabies*) which live in the soil, attacking the surface of the root. In edible crops such as potato, these scabs detract considerably from the market value, but they are not of consequence in sugar beet.

Galls growing from the side of beet always arouse much interest. They are the cancerous response of the plant to the presence of *Bacterium tumefaciens* in its tissues, and have been the subject of much investigation to determine what light they can throw on the mechanism of cancerous growths in living organisms.

So much for the diseases caused by fungi. The parasitic organisms are living plants having a visible morphology and life cycle. Seeing the fungus with the aid of the microscope, with its suckers implanted in the host tissue, leaves the observer in no doubt about its destructive activities. The virus diseases are more difficult to understand. Only the symptoms developed by the plant are visible. The thing causing them, the virus, is known as the cause of the disease only because its transference to a healthy plant will cause that also to show symptoms of disease. Although viruses can now be detected as blurred shapes under the electron microscope, it is not known how they increase within the tissues of living organisms.

Of the numerous virus diseases which attack sugar beet in various parts of the world, only two occur in crops in this

country; beet mosaic virus and yellows virus. Mosaic, although common and widespread, does little harm to crops in Lincolnshire. The fine-grained mottle symptoms it produces are similar to those of many other plant virus diseases. Mosaic virus may be transmitted to a healthy plant by rubbing the leaves with sap from an infected plant, as well as by the more usual agency of insect vectors—in this case aphides.

The yellows virus causes a very serious disease of beet known as Virus Yellows. Infection reduces the plant to a static condition, so that it produces very little sugar. The leaves at first become yellow, brittle and thickened and later wither. The plant is stunted and the crops look like fields of mustard in flower and no longer have the green vigorous appearance which indicates the efficient synthesis of sugar. Early infection causes as much as 50% to 60% reduction in the yield which might be expected from a healthy crop. The epidemic of 1943 was estimated to reduce the yield of sugar grown in this country by about twenty-six thousand tons, and another outbreak in 1944 has been equally, if not more, destructive.

The development of these epidemics is complicated, but is a fascinating story which is gradually being revealed, and which has to be understood if satisfactory measures are to be developed to combat the disease. Ultimately, infection in the root crop depends upon two factors; the abundance of aphides to spread the disease and the number of over-wintering sources of virus from which they can pick up infection. The virus can persist over-winter only on living plants, and so, as with Downy Mildew, the beet and mangold seed crops are a major source of infection for the root crop, and they become infected through the disease spreading from the root crops to the young seed plants in the autumn.

One of the vectors of the disease, *Myzus persicae*, the green peach aphis, carries the disease into the root crop early in the summer, but usually it causes the infection of only odd plants or patches of plants. Later, the beet crop is likely to be infested with heavy populations of black fly (*Aphis fabae*) which

further disseminate the infection introduced by *M. persicae*. Black fly coming to a healthy crop from a virus free source such as beans, does not cause infection with Virus Yellows, but if it has first fed, for instance, on an infected seed crop, it will cause very heavy infection in the root crop.

The severe epidemics of Virus Yellows in the last ten years have all been after mild winters, whereas in seasons following hard winters such as 1940, 1941 and 1942, there has been relatively late and localised infection. One of the reasons for this is that *Myzus persicae* is able to survive mild winters in the active form on green crops such as brassicae or even on young beet and mangold seed plants. Thus, after mild winters, an effective population is more quickly built up in the spring than after hard winters, when only the eggs survive. Infection which may become widespread in the autumn also tends to persist through mild winters on other plants such as ground-keeping beet and garden crops of Chenopodiaceous plants, so that in the following year the disease appears early even in districts where no seed crops are grown.

The most severe attacks of this disease have been in south Lincolnshire, whereas the more northerly parts have remained relatively free. Not only is the seed crop largely concentrated in the south, so providing a large source of over-wintering infection, but the intensive culture of potatoes and brassica crops favours the development and migration of large aphis populations.

Eventually, the most effective control of this disease will probably be the development of varieties which are resistant or tolerant to infection, but that will take some time. In the meantime, the most promising control method appears to be to produce virus free seed crops, and to clear up other sources of over-wintering virus infection before the disease spreads to the young root crops in the spring. Healthy seed crops could be produced by raising the young plants in districts which are relatively free from aphides and diseased root and seed crops, or possibly by exercising rigorous spraying, isolation and roguing measures on plant beds grown in the seed and root

growing districts. Such healthy seed plants could safely be grown in the main root growing areas without the menace of disease spreading from one crop to another.

This account of the diseases encountered in the sugar beet crop would not be complete without mention of the type of disorder which arises from faulty nutrition. Plants require considerable quantities of nitrogen, phosphate and potash if they are to make satisfactory growth, and lack of any of these foods causes disorders accompanied by characteristic symptoms.

As a result of the scarcity of potash in war-time a search was made for a satisfactory substitute and the obvious thing to try was sodium chloride. The interesting finding was made that instead of being a substitute for potash, it produced responses in yield of beet whether potash was applied or not, and so in itself was a food for beet. Thus the value of the practice of old agriculturists of fertilizing their mangolds with nitrogen and salt was rediscovered. Furthermore, a leaf disease which had been known as "Potash Deficiency" was found to be more satisfactorily cured by dressings of salt than of potash.

As well as the main plant foods traces of other elements must be available if plants are to continue in healthy growth. Manganese is almost always present in soils, but when there is much organic matter present and the reaction is alkaline, it is sometimes locked up so that it is unavailable to the plant. Crops are then affected in various ways; potatoes are stunted and chlorotic, oats develop Grey Speck and fail; peas develop Marsh Spot in the seeds, and sugar beet develops Speckled Yellows—a yellow mottling of the foliage which gives a crop a light yellowish-green appearance recognisable from afar. Crops affected in this way may be found in fairly well defined districts as it is characteristic of certain fen and gravelly soils. Much freshly ploughed grassland shows the same condition at first, but not later, when the turf has decayed. The symptoms

may rapidly be cured by an application of manganese sulphate.

A more serious trouble, but fortunately one of sporadic occurrence in dry summers, is caused by lack of boron. This too is characteristic of light alkaline soils, but those deficient in organic matter. There are a few places in Lincolnshire in which the disease occurs naturally, where drifts overlie chalk, but it is mainly induced by overliming light sands and gravels. The central leaves of affected plants die, the roots rot from the crown downwards. Many plants are killed if the disease is severe, and those which recover with moister conditions yield very little sugar. This disease is often induced by attempting to get heavy crops off poor land by liming and heavy nitrogen and salt applications. A dressing of borax before the trouble appears will prevent its occurrence.

Some diseases, like Heart Rot, are easily prevented by the application of a single, simple control measure. For others, the control measures which can be suggested in the present state of our knowledge are complicated and difficult to apply. Much of the complicated art known as "good farming" is the unconscious application of preventative measures against diseases which have been developed as a result of hard earned experience. Fresh endeavours, and changes in man's needs and methods continuously raise fresh disease problems, and also renew old problems which were thought to be solved, but which require fresh remedies in new conditions.

I am indebted to the British Sugar Corporation, Ltd., for the loan of three blocks illustrating this paper.

REFERENCES—

1. Large, E.C., The Advance of the Fungi, Jonathan Cape, 1940.

Report of the Hon. Secretary and Treasurer, 1944.

The progress and extension of the work and influence of the L N.U. recorded at the last Annual General Meeting, has not only been maintained but has developed during 1944. Larger attendances at the Annual Meeting and greater interest shown in discussion, caused your Executive Committee to decide to disassociate the Business Meeting and President's Address from the Sectional Officers' Reports and arrange two meetings. It was agreed that the President's Address should follow the Business Meeting and that this should be held in March rather than during the short days of of the late Autumn. That this departure has been amply justified was seen in the attendance and enthusiasm displayed at the meeting for Sectional Officers' Reports in November and is further demonstrated by the excellent attendance at this Annual General Meeting. Instead of Public Lectures, an informal meeting combining lecture and demonstration has been introduced this year with great success. Not only have these meetings enabled members to get to know one another but informative discussion has been promoted and members anxious to obtain information have made good use of these opportunities. The membership of the Union shows a further increase and the Junior Membership has been maintained and shows evidence of extending in the near future. It is encouraging to note that four life members were elected during the year. On the financial side, despite a heavy increase in printing costs, necessitating a special appeal for contributions to the Publication Fund, the balance at the end of the year was slightly higher than last year. This was due entirely to the excellent response to the appeal for additional donations towards the cost of TRANSACTIONS.

FIELD MEETINGS. Four meetings have been held in the field. The 207th meeting was at Freshney Bog, near Grimsby on 27th May. This well-known meeting place, made famous by the observations of John Cordeaux—cele-

brated 19th century naturalist and past-President of the Union —proved most interesting. There had been some modification in the habitat owing to drainage and a dense growth of sedges; some of the bog plants were absent or reduced in extent but there was much worthy of note. The rare Large Bittercress (*Cardamine amara*)—first discovered in 1910—was still flourishing and had increased since 1934. Permission to visit the area was given by Sutton Estates, Ltd., Great Coates and the Grimsby Golf Club, Ltd. Tea was taken at the Tudor Cafe, Grimsby. The 208th meeting on 24th June was at Caythorpe and Fulbeck A feature of the meeting was the great variety and interest of the flora both on the Marlstone at Caythorpe and the Lincolnshire Limestone at Byard's Leap. (*see* Botanical Report) The success of the day was due to the excellent local arrangements made by Mr. and Mrs J. C. Farmer, Miss M. E. Baines and Miss E J. Gibbons, who conducted the party. Tea was taken at Caythorpe and reports on the day's observations were made by Sectional Officers. The 209th meeting at Fiskerton, near Lincoln on 25th July, was a mid-week evening meeting. This again proved most successful and was well attended. Local arrangements were made by Mr. E. E. Steele of Fiskerton and permission to visit the disused brickpits was given by Mr. F. Butt of Reepham. The flora was again a feature—the Bladderwort (*Utricularia vulgaris*) was one of the most interesting records. After careful search by several members it was concluded that the rare Bog Violet (*Viola stagnina*) discovered there in 1936 had died out. This was its only known site in the County Drainage, followed by a dense growth of other low-growing plants, appeared to be the cause of this loss to the County flora. The 210th meeting was the annual Fungus Foray, this year held on October 14th at Riseholme Park, near Lincoln, by permission of Major C. Wilson of Riseholme Hall. This meeting was again a great attraction and the party was under the guidance of Miss G. M. Waterhouse of Lincoln Training College and Prof. C. G. C. Chesters of University College, Nottingham. A separate report on the Foray is published later (*see* Botanical Reports).

LECTURE-DEMONSTRATIONS. These meetings were exceptionally well attended and were held in the Lincoln Technical College Library. We are grateful to the Principal (Dr. E. R. Walter) and Mr. T. E. Hartley for much help in arranging the series. The opening lecture was by Mr. C. F. B. Shillito (Geological Secretary) on 11th March. His subject — "Washing and mounting of micro-fossils"—was a fascinating study and the members admired his excellent mounts of specimens from "washes" and the chalk of north Lincolnshire. "Freshwater Life" was the subject on 6th May. Miss G. M. Waterhouse introduced the topic and referred in some detail to the practical side of collecting specimens and maintaining aquaria; Mr. E. Wainwright spoke of the vast field of study provided by the diatoms and indicated lines of investigation; Mr. R. J. Batters contributed notes on collecting and photographing freshwater objects and Mr. Stephen Powell dealt with aquatic insects. On 17th June the meeting took the form of a symposium. Members contributed specimens and gave a brief description of their exhibits following which discussion was invited. Another symposium was held on 30th September when a wide variety of material was contributed by members. The series was concluded on 9th December when Mr. S. H. Robinson spoke on "the use of the microscope and accessories for low-power work". Various aspects of low-power work were demonstrated by Mr. R. J. Batters, Mr. T. E. Hartley, Mr. L. Horn, Mr. W. Ladlow, Mr. P. H. Shephard, Mr. D. Sinclair, Mr. E. E. Steele and Mr. E. Wainwright.

SECTIONAL OFFICERS' REPORTS. These were presented at a meeting held at Lincoln Technical College on November 4th. There was a good attendance of members and the additional time given for reports and discussion added greatly to the value of the proceedings. Films taken at the Field Meetings by Mr. E. Sewards and photographic records made by Mr. R. J. Batters and Mr. E. E. Steele were shown at the end of the meeting. Reports were presented as follows: Botany (Miss E. J Gibbons), Mycology (Miss G. M. Water-

house), Geology (Mr. C. F. B. Shillito), Applied Entomology (Mr. A. Roebuck), Microscopy (Mr. S. H. Robinson), Diatoms (Mr. E. Wainwright) and Photography (Mr. E. E. Steele). Reports were read from Mr. F. L. Kirk (Entomology) and Mr. S. A. Cox (Ornithology).

NATURE RESERVES INVESTIGATION SUB-COMMITTEE. The final report embodying the provisional scheme for Lincolnshire was completed and submitted to the Nature Reserves Investigation Committee, together with maps delineating the approximate area of the individual reserves. The decision and comments of the Committee are still awaited and until they arrive little further action can be taken locally.

WOODPIGEON INVESTIGATION. Records have again been collected from observers in the County and forwarded to the British Trust for Ornithology. The response of members was disappointing and a renewed appeal was made for observers in 1945.

SQUIRREL SURVEY. The Bureau of Animal Population at the University Museum, Oxford, invited our cooperation in connection with an enquiry into the present distribution of Grey and Red Squirrels, to follow up the report published in 1937 by Middleton and Parsons. Members responded well to the appeal for information and a representative picture of the position in Lincolnshire was obtained From the data available it appears that at least 40 square miles of Kesteven has been colonised by the Grey Squirrel in the last 7 years and it has now crossed the River Witham at two points. A watch should, therefore, be kept in Lindsey for its appearance and immediate notification made to City and County Museum, Lincoln. A detailed summary of this data will be published later.

MEMBERSHIP. The total membership shows an increase of 18 on last year. The details are as follows:

Hon. Life Member	1	228
Life Members	8	
Ordinary Members	202	
Junior Members	17	

4 Life Members (two transferred from ordinary membership), 30 Ordinary Members and 3 Junior Members have been elected during the year. There have been losses owing to death and lapsed subscriptions.

The following have been elected during 1944:

Life Members:

Mr. F. W. Brown, The Chestnuts, Ruskington
Dr. R. W. Butcher, Culford House, Bramcote, Notts.
Mrs B. W. Fowkes, Coleby Hall, Lincoln (transferred)
Mr. T. H. Wallis, c/o C. S. Dickinson, Ltd., Lincoln (transferred)

Ordinary Members:

Miss M. E. Baines, East View, Fulbeck
Mrs. R. E. Boothby, Staunton, Notts.
Mr. F. E. Bovill, Cross o'Cliff Hill, Lincoln
Mr. A. E. Brown, Mill House, Brayford Street, Lincoln
Miss M. A. Palmer Brown, c/o 86 Newland, Lincoln
Prof. C. G. C. Chesters, PH.D., University College, Nottingham
Mr. W. Q. Connold, 22 London Road, Sleaford
Mr. and Mrs. J. C. Farmer, The Bungalow, Fulbeck
Miss W. M. Hall, 57 James Street, Louth
Mr. S. J. Harrop, F.Z.S., 61 Addison Drive, Lincoln
Mrs. A. M. Henderson, 2 Queen's Crescent, Lincoln
Rev. Gilbert Houlden, St. Peter-at-Gowts Vicarage, Lincoln
Miss M. Huntbach, Manor Cottage, North Rauceby
Mrs. W. Ladlow, 11 Norfolk Street, Lincoln
Miss M. M. Lilly, B.Sc., 185 Winsover Road, Spalding
Miss M. Loftus, De Aston School, Market Rasen
Mr. G. W. Mawer, Wragby, Lincoln
Mr. J. Peacock Rayner, 4 Riseholme Lane, Lincoln
Mr. R. M. Rickard, Post Office, Coningsby
Mr. E. C. Riggall, 36 Broadbank, Louth
Mr. A. R. N. Rooksby, 17 St. Edmund's Road, Sleaford
Mr. H. Small, Skellingthorpe, Lincoln
Mr. and Mrs. E. Stockley, 11 Longdales Road, Lincoln
Mr. J. E Taylor, 1 Fairfield Avenue, New Balderton
Mrs. J. H. Ward, 5 Mollison Avenue, Cleethorpes
Miss W. Watson, 11A Longdales Road, Lincoln
Mr. G. B. Wells, Brooklyn, Ruskington
Mr. G. F. Young, Manor House, Potterhanworth

Junior Members:

P. M. Gilbert, 202 Boultham Park Road, Lincoln
E. H. Mawer, 9 Hawthorn Road, Gainsborough
J. Webster, 5 Parker Avenue, Lincoln

During the year we have lost by death three members of long association with the Union. Mr. Fred Kime of Boston died in February. He joined the Union in 1923 and was one of its most enthusiastic members, rarely missing a meeting. His attachment to the study of nature and in particular his love and wide knowledge of the birds and flowers of the marshland, was always an inspiration to those who were priviledged to accompany him on a ramble in his native haunts. Along with his friend, the late S. J. Hurst, he had always been the moving spirit in a very active group of naturalists in Boston and the Union owes a great deal to their combined efforts. The many meetings they led in the Boston area were always a success and full of interest. He was secretary for Marine Zoology and contributed much to our knowledge of the marine fauna of the Boston Deeps. The Union has sustained a great loss in his passing. Mrs. Stewart of Partney who died in February, became a member in 1925. She was keenly interested in the flora of the Wolds and had contributed notes to the County Flora. Another member of many years association, Mr. W. B. Havelock of Grimsby, who joined in 1920, died in June. Before his retirement he was Forester to the Earls of Yarborough and in that capacity assisted in the local arrangements of many meetings at Brocklesby. He was a valued referee in all matters relating to forestry and trees.

May I conclude the report by expressing my thanks and the gratitude of the Union to all members who have contributed so much to the very successful year's work and in particular to the President for his enccouragement and valuable suggestions. Our thanks are also due in an especial way to those who have been responsible for lecture-demonstrations and again to Dr. E. R. Walter for his ready help whenever called upon.

Sectional Officers' Reports.

BOTANY.

Miss E. J. Gibbons.

The first meeting was held at Freshney Bog; I was unable to be there. This area has been well worked in the past and no new records were made. Several interesting plants were seen but it was noticable that they were becoming less abundant, perhaps owing to drainage of surrounding land. The Large Bittercress (*Cardamine amara*) and Bog-bean (*Menyanthes trifoliata*) were observed.

The next meeting was held at Caythorpe in June in perfect weather The three local members were most helpful in suggesting the route. A disused quarry was full of interest. Grass Vetch (*Lathyrus Nissolia*), Soft Knotted Clover (*Trifolium striatum*) Marsh Speedwell (*Veronica scutellata*) and Knotted Parsley (*Caucalis nodosa*) were the best finds. Later the members divided into two sections, those with bicycles visiting Byard's Leap on the Oolite, where Purple Milk Vetch (*Astragalus danicus*), Horseshoe Vetch (*Hippocrepis comosa*) and Small Field Scabious (*Scabiosa columbaria*) made a good show. The rest of the members went on to the Ironstone workings at Frieston where there is a large piece of water which was more profitable to the other branches than to the botanists

In July, an afternoon meeting gave us another fresh area for investigation, at Fiskerton. Unfortunately the Bog Violet (*Viola stagnina*) had disappeared—let us hope temporarily—but Bladderwort (*Utricularia vulgaris*) was growing close by. Yellow Loosestrife (*Lysimachia vulgaris*) and Water Chickweed (*Stellaria aquatica*) were growing on the bank of the Witham. In the Wood other finds included Cow-wheat (*Melampyrum pratense*), Millet grass (*Milium effusum*), Wood Small Reed (*Calamagrostis epigeios*) and Small-leaved Lime (*Tilia cordata*). Another clay-pit provided Water Milfoil (*Myriophyllum verticillatum*) in full bloom, which was to me the most unusual find of the day. Afterwards a few of us went on to Short Ferry where we found Water Hone-wort (*Apium inundatum*), Yellow

Watercress (*Nasturtium amphibium*), *Potamogeton prælongus* and Simple Bur-Reed (*Sparganium simplex*).

The Fungus Foray at Riseholme is reported elsewhere. A large patch of *Impatiens parviflora* was well established in a shrubbery.

Several queries have been sent in, one about the distribution of Field Maple (*Acer campestre*) from the Dept. of Forestry at Oxford, also of the various species of Oak and their frequency. Any notes and observations from members will be welcome and references to Sycamore (*Acer Pseudo-platanus*) in history.

New district records for 1944 include:—

Bidens cernua	14	F. T. Baker
Botrychium Lunaria	3	R. May
Erigeron canadensis	6	Miss E. J. Gibbons
Erysimum orientale	8	Miss C. D. Marsden
Koeleria cristata	6	Miss E. J. Gibbons

FUNGUS FORAY—RISEHOLME PARK, near LINCOLN.

14 October, 1944.

Miss G. M. Waterhouse, M Sc.

This year the area chosen for the foray although not providing such attractive species as the Hartsholme area explored last year, did nevertheless give a varied selection. The enthusiasm of the party was undoubted and the fact that bright colours did not predominate did not damp their ardour. On this foray there were four main habitats of fungi: (1) on fallen logs, (2) on cut stumps, (3) on living trees, (4) on the ground and on dung. Fallen logs and cut stumps are always a happy hunting ground of mycologists and in this we were not disappointed. On fallen logs the usual common species, *Polystictus versicolor* (Linn.) Fr. and the white incrustations of *Corticium* sp. were found plentifully. Three gelatinous fungi, *viz.* Jew's Ear (*Auricularia auricula — Judae* (Linn. Schroet), *Auricularia mesenterica* (Dicks.) Fr. and *Dacromyces*

deliquescens (Bull.) Duby, making orange spots were common. The silver-leaf fungus (*Stereum purpureum* (Pers.) Fr.) usually destructive to plum trees was found fruiting on logs. Gill bearers on logs were the beautiful pink *Pleurotus palmatus* (Bull.) Quél. and the hardly less beautiful *Tricholoma rutilans* (Schaeff.) Fr. with its yellowish cap flecked with purple scales. Ascomycetes on fallen logs were numerous:—brown elf cups (*Peziza vesiculosa* Bull.) on elm, and the candle-snuff fungus (*Xylaria hypoxylon* Grev.) were frequent. Single specimens of *Xylaria polymorpha* Grev. usually on beech, *Hypoxylon fuscum* (Pers.) Fr. and *Daldinia concentrica* (Fr.) Ces and de Mot, which had obviously killed an Ash tree.

On dead stumps one may find firstly the species which killed the tree e.g. *Polyporus betulinus* (Bull.) Fr. and *Stereum purpureum* (Pers.) Fr. Secondly, there are the saprophytes which appear later and these are many:—*Coprinus atramentarius* (Bull.) Fr., *Coprinus micaceus* (Bull) Fr., *Pleurotus sapidus** Schulz., and *Pleurotus ulmarius* (Bull.) Fr. all on elm, *Pholiota squarrosa* (Müll.) Fr. on silver birch and sulphur tuft (*Hypholoma fasciculare* (Huds.) Fr.) on pine; *Polyporus varius* Fr., *Coryne sarcoides* (Jacq.) Tul., a species of *Calocera* and the candle-snuff again.

The only fungi found on living trees were *Fomes ulmarius** (Sow.) Fr. on wych elm and Tar spot of sycamore (*Rhytisma acerinum* (Pers.) Fr.) always very common.

On the ground there were many, but only a few of these were identified, two ink caps, *Coprinus comatus* Fr. which was practically over and *Coprinus radiatus* (Bolt.) Fr., *Tricholoma personatum* Fr., the Bluet, *Panaeolus campanulatus* (Linn.) Fr. and one mushroom *Agaricus campestris* (Linn.) Fr.

Other species which were identified were *Claudopus variabilis* (Pers.) Sm., *Pholiota adiposa* Fr. and *Hypholoma hydrophilum** (Bull.) Fr.

Dr. J. Ramsbottom kindly identified ten of the above species, and those marked * are new records for the county.

Prof. C. G. C. Chesters has supplied the following notes on species he observed at the Foray:—

Pyrenomycetes.

Diatrypella favacea—a widely distributed species with several growth-forms of which two were collected on beech and birch.

Diatrype stigma — this species like the foregoing inhabits freshly dead branches of deciduous trees and certain bushes. It was collected on birch, beech and hazel.

Diatrype disciformis—collected on beech with *D. stigma*, this species is almost confined to this host and occurs only occasionally on others such as sycamore.

Daldinia concentrica—old, black and dry stromata of this species were discovered on fallen ash trunks (its normal habitat) and a few young, but not sporing, stromata were observed.

Hypoxylon fuscum—confined in this country to hazel and alder this species was collected on both hosts but, as is usual, more plentifully on the former.

All the foregoing are compound pyrenomycetes with several perithecia in each fructification; only two species belonging to the simple pyrenomycetes, with separate, individual perithecia were observed. Of these *Melanomma pulvis-pyrius* was widespread on elm, chestnut, very dry beech and hazel. *Bertia moriformis* was collected in a dry and exolete condition from some elder twigs.

Fungi Imperfecti.

Trichoderma viride was observed on several partly buried branches, but in no case were the perfect stromata of the *Hypocrea*, of which this is the conidial condition, observed.

Apart from the Foray there have been few records of fungi in the county this year. On the summer expeditions of course they are much less in evidence. At Great Coates on May 27th we found tar spot of sycamore just starting, smut (*Ustilago antherarum* (DC) Fr.) in the flower of Red Campion (*Lychnis dioica*), mildew on grass and rust on meadow sweet. At Caythorpe on June 24th we found smut in the flowers of White Campion (*Lychnis alba*) and mildew on Wild Rose.

ENTOMOLOGY.

F. L. KIRK, B.Sc.

In 1938 a locust was reported from Spalding as an alien. This has now proved to be the Wartbiter (*T. verrucivora*) which occurs rarely in England. From the circumstances of its capture this specimen was probably from abroad. The popular name is derived from its alleged use by Swedish peasants to bite warts and thus remove them.

The present season has been abnormal. The spring and early summer insects were well represented, but several entomologists have stated that the later part of 1944 was the poorest season they had ever experienced.

Some most interesting butterfly records have come in. Mr. T. C. Taylor found the Silver Studded Blue (*L. aegon*) which is very rare in Lincolnshire. He also obtained Greasy Fritillary larvae (*M. aurinea*) in April and Brown Hairstreak larvae (*Z. betulae*) in June at Skellingthorpe. The Rev. G. Houlden saw freshly emerged Greasy Fritillaries and also Chequered Skippers (*C. palaemon*) and Pearl-bordered Fritillaries (*A. euphrosyne*) on May 31st at Skellingthorpe. He sent word that White Admirals (*L. sybilla*) were reasonably common not far from Lincoln; it is good news that they are again established in the county. In view of this there is the possibility of the Purple Emperor (*A. iris*) coming back to its old haunts. A few reports have come in during recent years of possible specimens, but they were not sufficiently authentic to justify their inclusion as definite records.

In August Mr. T. H. Court took a variety of the Ringlet (*A. hyperanthus* var. *caeca*). On August 17th Mr. C. Else found the Grayling Butterfly (*S. semele*) at Barton-on-Humber. He sent in a most interesting list of dates of first appearances of more than sixty insects, some of which are noted below.

There has been little else of outstanding interest about butterflies. The Holly Blue (*C. argiolus*) occurred on May 25th at Skellingthorpe. A Comma (*P. c-album*) was seen there on July 17th and two more at Market Rasen in August. This

species has been scarce in Lincolnshire this year and judging by the previous history of the distribution of this insect, it may disappear for a long time. Both the Painted Lady (*P. cardui*) and the White-letter Hairstreak (*T. w-album*) have been very scarce this season. The Dark Green Fritillary (*A. aglaia*) has been abundant.

Mr. A. Chambers of Grantham kindly sent a detailed account of his records for the season and this confirmed the comparative scarcity of many of the butterflies. He took 5 *ab. coeruleopunctata* of the Small Copper (*C. phlaeas*) at Great Gonerby, and the Chalk-hill Blue (*L. corydon*) and Brown Argus (*L. astrarche*) were on the wing at Ancaster in August.

A few interesting records of Moths have come in. Mr. T. H. Court sent me a specimen of the Convolvulus Hawk Moth (*S. convolvuli*) taken at Market Rasen. Mr. Else sent word that a boy found a female Convolvulus Hawk resting on a path at Barton-on-Humber. Mr. Else kept it till dusk and had difficulty in making it fly away, although in the end it departed at high speed. Another Convolvulus Hawk was reported from Wainfleet and yet another from Boston by Mr. Rimington Wells, who also records larvae of the Death's Head (*A. atropos*) and the Lime Hawk (*D. tiliae*) and Elephant Hawk (*D. elpenor*).

Mr. A. Chambers had considerable success in rearing specimens from larvae collected in 1943. These included the Large Elephant Hawk (*D. elpenor*), Eyed Hawk (*S. ocellata*), Mullein (*C. verbasci*) etc. He found a large colony of Burnets (*Z. trifolii*) at Great Gonerby and took a very large specimen, possibly *palustris*. He also saw the Humming Bird Hawk (*M. stellatarum*) at Grantham in July.

Mr. F. T. Baker stated that Lime Hawks (*D. tiliae*) have been plentiful near Lincoln. The Broad-bordered Bee Hawk (*H. fuciformis*) was taken by the Rev. G. Houlden on May 31st at Skellingthorpe and Mr. T. H. Court saw several at Market Rasen as well as some Fox Moths (*M. rubi*). Red Underwings (*C. nupta*) have been generally common.

Mr. T. C. Taylor has taken the Orange Underwing (*B.*

parthenias), the Yellow Horned (*P. flavicornis*), Grey Birch (*T. punctularia*) and Ruby Tiger (*P. fuliginosa*) as well as larvae of the Centre-barred Sallow (*C. xerampelina*), Iron Prominent (*N. dromedarius*) and many others. He bred a typical specimen of the Peppered Moth (*P. betularia*) although the black form is more common now.

A former president, Mr. A. Smith sent in a record of the Tawny Speckled Pug (*E. subfulvata*) from Grimsby.

Mr. Else at Barton-on-Humber has seen the Humming Bird Hawk (*M. stellatarum*), the Sword Grass (*C. exoleta*) and the Dark Sword Grass (*A. suffusa*). He found many larvae of the Elephant (*D. elpenor*), Poplar (*S. populi*) and Eyed (*S. ocellatus*) Hawks and noted that the Double Dart (*N. augur*), Stout Dart (*A. obscura*), Marbled Beauty (*B. perla*) and the Marbled Carpet (*C. immanata*) have been common this season.

Concerning beetles the outstanding record was the swarming in enormous numbers at Lincoln of the Summer Chafer (*A. solstitialis*); they even invaded H.M. prison! The fine Longhorn beetle, *Saperda carcharias* was taken at Boston.

Hymenoptera were represented by the Birch Sawfly (*C. femorata*) and the magnificent Ichneumon *R. persuasoria*, which were both observed by Mr. Court. Mr. Rimington Wells reported *Sirex gigas* from Boston and stated that *S. noctilio* was the species more often found there.

A correction is needed to last year's report. Mr. C. Else recorded the Chequered Skipper (*C. palaemon*) from Ferriby Cliff, this should have been the Grizzled Skipper (*S. malvæ.*)

I close this, my last report, by thanking members for all their help during the time I have had the pleasure of acting as Entomological Secretary and wish to say how much I have missed the enjoyment of attending L.N.U. meetings. I should also like to pay a tribute to Mr. F. Kime, of Boston. He was one of our keenest members and a very good friend to me. Although he never claimed to be an entomologist, the specimens he forwarded were always of interest and his identifications were invariably accurate.

NOTES ON THE ECONOMIC ZOOLOGY OF LINCOLNSHIRE DURING 1944.

A. Roebuck, N.D.A., F.R.E.S.

As usual these notes only deal with a few of the more striking pests which have been recorded during the year. The general feeding pests such as slugs, wireworms, leatherjackets and millepedes were present in about normal numbers. Of the Crane Flies, *Pachyrrhina maculata* appeared to be more abundant than in recent years. This is particularly the species which occurs in old gardens. The predominant Click Beetle in old gardens is *Athous haemorrhoidalis*.

Cereals.

Wheat Bulb Fly (*Leptohylemyia coarctata*) did more damage again to the wheat. Frit Fly (*Oscinella frit*) caused considerable damage to both wheat and oats. There were scattered attacks by the moths *Miana strigilis* and *Apamea secalis* on the shoots of cereals, and by *Apamea basilinea* on the ripening ears of wheat. The Wheat Shoot or Mud Beetle (*Helophorus nubilis*) did damage near Grantham and it may have been the cause of a failure near Lincoln. The chief aphis on cereals was *Macrosiphum granarium*.

Pulse Crops.

Attacks by Black Aphis (*Aphis fabae*) were severe locally in the early part of the season. They were first noticed on beans on June 6th and in one field of 10 acres they had spread over the whole area by the end of the month. The greater attacks were on the sugar beet seed crops. All attacks faded away early in July so the mangolds and sugar beet crops were not harmed. The Green Pea aphis (*Macrosiphum pisi*) was abundant and destructive to field crops. Some crops of clover seedlings were destroyed, immediately the cover crops of cereals had been cut, by *Sitona lineatus* adults. Pea Moth (*Cydia nigricana*) did more damage as more crops were left to mature.

Potatoes.

Attacks by the aphis *Myzus persicae* were slight. Considerable damage was done by the eelworm *(Heterodera rostochiensis)* and there was more damage done by the stem eelworm, *Anguillulina dipsaci*, on the mature tubers in the south of the county. The caterpillars of *Hydroecia micacea* were widespread. It is now well established as a minor potato pest and is becoming known as the Potato Moth. It also tunnels the bases of tomato plants.

Root Crops.

The outstanding pest on Turnips and Swedes was the Midge (*Contarinia nasturtii*). This destroys the terminal bud causing a many-necked or multiple-topped plant. Cracks may develop followed by rotting. Flea Beetles (*Phyllotreta*) were scarce. The Mangold Fly (*Pegomyia betae*) was again more abundant than for many years. Carrot Aphis (*Cavariella capreae*) was more widespread and harmful than usual.

Fruit Trees, etc.

There was a considerable increase in the number of Codling Moths (*Cydia pomonella*) and the larvae were very abundant at the end of the season. This has been virtually absent for many years. Two micro-lepidopterons deserve mention. They occurred in the north of the county, *Coleophora* (*Eupista*) *nigricella* (The Apple and Plum Case Bearer) and *Spilonota ocellana* (The Bud Moth). The Greenhouse Millepede (*Orthomorpha gracilis*) occurred in Lincoln.

MICROSCOPY.

S. H. Robinson M.Sc., F.R.M.S.

The following collections have been made and examined during the year:—

March 31st. Ditch at Pyewipe, Lincoln. Rhizopods: *Arcella vulgaris*, *Difflugia corona* (Crowned Difflugia). Diatoms: *Gomphonema geminatum*, *Synedra splendens*, *Navicula amphisbaena* (Constricted Navicula), *Pinnularia major* (Great Pinnularia). Desmids: *Closterium strigosum* (Lined Closterium), *Closterium*

lunula (Moon-shaped Desmid). Infusoria: *Stentor polymorphus* (Trumpet animalcule), *Vorticella* (Bell animalcule), *Actinophorys sol* (Sun animalcule), *Actinasphaerium uchornii* (Large Sun animalcule). Rotifers: *Rotifer vulgaris* (Free swimming). Hydrozoa: *Hydra vulgaris* (Common Hydra). Worms: *Nais*, *Planaria*.

Apparatus: Collecting stick with bottle, net and hook. Stage trough and Beck compressor. Objectives 1-in., $\frac{1}{3}$-in. and $\frac{1}{4}$-in.

May 20th. Ditch on West Common near to Foss Dyke, near Lincoln. Algae: *Spirogyra*. Rotifers: *Philodena roseola* (Round Philodine), *Rotifer neptunis* (Telescopic Rotifer), *Pterodina patina* (Flask Rotifer), *Brachionus pala* (Pitcher Rotifer). Entomostraca: *Daphnia pulex* (Water Flea), *Cyclops viridis* (Common Cyclops), *Cypris* (Clouded Cypris).

Apparatus: Collecting stick with net, stage trough, live box and Beck compressor. Objectives $1\frac{1}{2}$-in. and 2/3-in. with paraboloid for dark ground.

June 10th. Ditch at Humberstone. Diatoms: Pure gathering of *Meridion aviculare*, collected by Mr. Donald Sinclair and sent for identification. Examined with $\frac{1}{4}$-in. obtective.

July 4th. Lake at Benniworth. Water mites: *Hydracarina* (red and blue-green mites). Collected with glass tube and stick and examined in stage trough with 1-in. objective.

August 3rd. Pond at Goltho. Algae: *Volvox globator* (Green Volvox). Diatoms: *Pinnularia viridis* (Narrow Pinnularia), *Cocconema lanceolatum*, *Campylodiscus costatus* (Ribbed Campylodiscus), *Synedra radians*. Polyzoa: *Paludicella*. Rotifers: *Eosphora aurita*, *Rotifer vulgaris*, *Mastigourea carinata* (Whip tail) Aquatic larvae: Gnat, Dragonfly, Caddis fly.

Apparatus: Collecting stick with net, bottle and hook. Drag hook and concentration bottle. Pondside trough. Stage trough, Beck compressor and live box. Objectives $1\frac{1}{2}$-in., 2/3-in., 4/10-in. and 1/6-in. Dark ground by spot lens paraboloid.

ORNITHOLOGY.

S. A. Cox.

During the present year I have been well placed for the pursuit of bird-study, and have made the most of my spells of leisure, but records for Lincolnshire are few and far between, and I must rely almost entirely on the observations of others more fortunate, who still reside in the home county.

Mr. R. May reports that there were two Wigeons on Newsham Lake on March 3rd, and on the same date I heard the call of a Lesser Spotted Woodpecker at Fulbeck—a now-familiar sound in the south of England. The Lincolnshire landscape looked quite Swiss in its mantle of snow, the sunshine was glorious, and the air crisp and delightful. The Lesser Spotted Woodpecker was also seen and heard by Mr. May at Newsham Lake on March 5th, when a Wigeon and a Pintail were noted. Long-tailed Titmice were building at Limber on March 28th, where the first spring migrants, the Chiff-Chaff and Willow Warbler, appeared on April 9th. The Lesser Spotted Woodpecker was heard at Limber, and two nests of the Tawny Owl each contained three eggs. Miss Gibbons reported the first Willow Warbler from Holton-le-Moor on the same date. Mrs. Farmer saw the first Swallow at Fulbeck on April 12th—Mr. May, further north, recorded it on the following day at Brocklesby. The Sand Martin appeared at Limber on the 14th. Fieldfares were last seen on the 13th and Redwings on the 16th. The Common Whitethroat appeared on the 16th, an unusually early report, and the Blackcap on the 17th. The first Nightingale appeared in the young woodlands near Limber Double Gates on April 22nd, and subsequently a second singing bird appeared. The Lesser Whitethroat appeared in the north of the county on April 24th, and the first House Martins on the 27th. A Wood Warbler appeared for a single day in Mausoleum Wood on April 28th, and then, as usual, it passed on to more northerly breeding haunts. Mr. May reports two Redshanks' nests, each

with its full complement of eggs, at Goxhill on April 30th, also three Mallards' nests and the first Whimbrel.

The Wheatear and Yellow Wagtail were noted at Limber on May 1st, but both birds had doubtless been passing for some weeks in coastal districts. On the 3rd a Wheatear, suspected to be the Greenland variety, was seen following the plough, at Fulbeck—a new bird record for this parish. The first Swift was seen by Miss Baines at Grantham on May 2nd, and the Turtle Dove appeared at Limber on the 4th. On the 7th Mr. May found the nest of a Bullfinch with eggs in a bamboo—its favourite nesting site—at Little Brocklesby. A Barn Owl's nest in a hollow ash at Limber also contained two eggs. Unfortunately this nest was later deserted. The Tree Pipit was also seen by Mr. May—much later than its normal date of appearance—but there are no suitable sites for nesting in the Limber district at the moment, and it was doubtless a bird of passage. The Spotted Flycatcher appeared at Brocklesby on May 8th, and a second Wood Warbler, which was seen at the same place on the 10th, also passed on. A Blackcap's nest at Limber already contained two eggs on May 13th. Garden Warblers were apparently exceptionally scarce in the north of the county, and had a bad time during the cold spell early in June, when they are normally sitting. Mr. May does not chronicle their arrival, but I heard the first at Fulbeck on May 14th—also Spotted Flycatchers. It was pleasant, too, to listen once more to a Cranwell Nightingale—my only encounter with the species in Lincolnshire this year, though I heard some fine songsters in Essex. Mr. May found a second Blackcap's nest at Holton-le-Moor on May 14th. Goldfinches seem to have been particularly plentiful as a nesting species—the first nest at Habrough on May 19th contained six eggs. Turtle Doves lose little time before they start nesting, and on the 20th one nest at Limber contained its first egg. The first Nightingale's nest was located by Mr. May amid nettles and brushwood at Limber Double Gates on May 21st, and contained five eggs. This pair of birds were also affected by the intense cold, and only succeeded in rearing two young. Nests

of a further Blackcap and a Jay were also found on the same day. A Coal Tit's nest in a decaying hornbeam at Limber on the 23rd was located, and at this time there were no fewer than four Tawny Owls with broods within half a mile of Limber village. Reed Warblers appeared at Newsham Lake on May 25th, and, subsequently, both here and at the ponds in Brocklesby Park, they were more numerous than ever before. A Kingfisher was also disturbed from its nesting tunnel, which contained eggs. The first Lesser Whitethroat's nest, containing six eggs, was found at Limber on May 30th.

On June 1st a Sparrow-Hawk was disturbed from its nest and six eggs, whilst the second Nightingale's nest, containing five young, was found on the following day at Limber. Nests of Kestrel, with six eggs, and Sedge Warbler, with four eggs, were seen on the 3rd; also a Whinchat with five eggs—all records of this day were by Mr. R. May from Barrow-on-Humber. Two Red-backed Shrikes had been seen for some time about a wild, unkept orchard, and Mr. May saw them, but they subsequently took their departure and did not nest. A Little Owl stayed and brooded its tiny young whilst Mr. May examined its larder on June 17th—the contents were twelve mice. A Quail was heard near Audelby Top, and at least three pairs of Great Spotted Woodpeckers were known to have broods—one boring was actually in use for the third successive season. A Great Crested Grebe came to Lambert Hill on June 8th and stayed for about eight days. On the same day a Kestrel's nest at Limber was found containing five young. On the 13th a male Lesser Spotted Woodpecker was found with a broken wing, but, despite attention, it died from its injuries—its mate stayed in the vicinity for some time. A Goldcrest nested in a yew in Mausoleum Wood—on June 15th; the nest contained eggs. Another Goldcrest at Little Brocklesby also reared a brood, and the egg of a Cuckoo was found in a Linnet's nest—surely a folorn hope for a foster parent. Nests of Snipe and Reed Warbler, each with four eggs, were seen by Mr. May at Goxhill on June 18th. A brood of Green Woodpeckers was hatched at Limber on June

20th, and the first Corn Bunting's nest—always a late nester—contained its first egg. Nests of a Red Bunting (four eggs) and a Lesser Whitethroat (five eggs) were seen at Newsham Lake on the 24th—the latter a district record. The L.N.U. field meeting on the same date produced little of special interest in the way of bird life, though a Great Crested Grebe was seen at Frieston Ponds. A Goldfinch's nest in a privet hedge at Fulbeck contained four eggs. The Grasshopper Warbler is always a bird of mystery, and this year it was not detected, nor did it sing, until July 30th, at Limber. Here it sang regularly from a certain spruce fir, and Mr. May watched it, after dusk, at a distance of less than a yard. He was able to look right into its gaping mouth, like a dark spot in the gloom.

Quails were again heard calling in two localities at Limber on July 6th, where the Cuckoo continued to call until the 8th. Goldfinches were still nesting late in July, and an apple tree at Brocklesby was occupied for the third time in four years. Three belated nests of the Reed Warbler in Brocklesby Park all contained eggs on July 23rd. The Great Crested Grebe nested again at Croxby Pond, and must now be considered a regular breeder in this part of the north wolds. A Kingfisher and fifteen Common Sandpipers, the latter rather remarkable, were disturbed there on July 30th.

With the advent of August, autumn migrants began to be in evidence, and three Whimbrels passed over Limber on the 2nd The first Green Sandpiper was seen on the 7th. On the 21st an immature Shelduck was seen at a pond in Limber. A Common Sandpiper was seen at Lambert Hill on the 27th. Belated nests of Goldfinch and Yellowhammer were seen during the month.

Wheatears and a Whinchat were seen at Limber on September 2nd, and two Green Sandpipers and a Redstart at Newsham Lake on the 8th—this latter a new denizenfor this locality. Two belated Common Sandpipers were seen at Limber on September 23rd. Miss Baines saw two Swifts at Fulbeck on September 14th. The first Geese, almost certainly

Pink-footed, were seen by Mr. May on September 28th, and House Martins were still tending young in the nest.

The Willow Warbler was seen at Limber on October 1st, and there were six Wigeon on Newsham Lake. Mr. May reports two Grey Wagtails, the first this Autumn, by the beck-side at Newsham Lake on October 10th. Also the nest of a Ring-Dove at Somerby, with young, as late as the third week of October. Wild Geese, he says, are less numerous this year. Redwings appeared on October 12th, but were preceded by Bramblings on 9th. On 21st, Mr. May saw a flock of Redwings scattered by the approach of a Merlin, one of our more distinguished Autumn visitors. Swallows were still present at Limber on 24th.

Little Owls appear to be decreasing in north Lincolnshire, though the Tawny Owl, happily, is much more numerous. Tree Creepers and Goldcrests seem scarcer than usual, but Long-tailed Titmice are more abundant than ever. For the first time for about twenty years, no Dabchicks were found nesting at Limber.

Mr. A. E. C. Chambers has kindly supplied some additional information as to the status of the Nuthatch in Lincolnshire. He finds it frequently in parks in the vicinity of Grantham, where there are old and tall trees. His observations spread over a period of nine years, and he records the species for Belton Park, Stoke Rochford and Barrowby. A nest with young is recorded at Belton Park on June 14th, 1935. In the spring of 1937, Mr. Chambers was informed by Canon H. E. Stancliffe of Belton Rectory, that he knew the whereabouts of a nest in the Wilderness gardens, but the exact position was not disclosed. Also, this year, Capt. W. A. Cragg reports the bird from his garden at Threekingham.

Regarding summer visitors for the year 1944, Mr. Chambers says that all the warblers and the Nightingale were as plentiful as in other years. Corn Buntings were more numerous. Swifts appeared on May 5th at Grantham and the main body left on August 17th. A Lesser Spotted Woodpecker was seen in Belton Park on November 29th, 1943. Four

Ruffs or Reeves were watched by Mr. Chambers on the flooded area of the sewage farm at Marston on October 24th, 1943. They stayed for several days—one was subsequently shot and brought to Mr. Chambers. On May 13th, 1944, a Hoopoe was watched for half an hour by a reliable observer, whilst feeding on a lawn at Great Gonerby. On May 8th, 1944, a Spotted Crake was taken in a trap on swampy ground near Aswarby. This was identified by Dr. W. B. Alexander, of Oxford.

PEREGRINE FALCON AT LINCOLN.

In December, we received an interesting letter from Mr. Frank B. Evans, of the Bishop's Hostel, Lincoln, in which he described the occurrence of the Peregrine Falcon near the Lincoln Cathedral in November 1943 and October 1944, apparently on a migratory visit. In 1943 the bird was identified by the call-note alone, but in October 1944, from 22nd to 29th, Mr. Evans was fortunate to see the bird twice and on the second occasion to identify it unmistakeably as the Peregrine. On 25th the bird was noticed to "strike" at a pigeon which managed to elude capture by dashing nearly to ground level on the south side of Cathedral and flying into the South porch, the Peregrine swooped upwards to disappear among the towers. The typical call-note was heard at intervals for a week and then the bird moved on.

Whether it was the same bird in both years it is impossible to say but the time of the year and duration of the visit indicated it was a migrant. Mr. Evans was well acquainted with the species and had studied its habits during the breeding season in other parts of the country.

F. T. B.

PRESENTED
14 DEC 1945